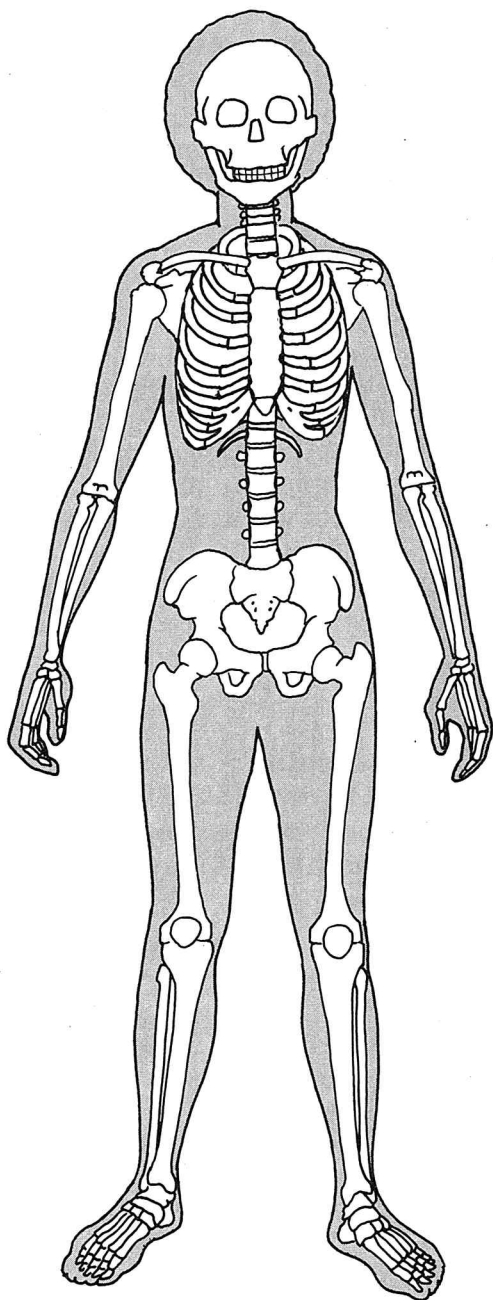


# The Skeleton



## Objectives

Students will:

- identify the parts of the skeleton
- learn what the skeletal system does
- discover which bones they use at different times.

## Building Understanding

1. Ask students:

- Have you ever seen a skeleton? Where? What was it made of?
- Have you ever held part of a skeleton, such as a chicken or turkey bone? What did it feel like?
- Have you ever seen inside a bone?

Explain that our skeleton makes up our skeletal system.

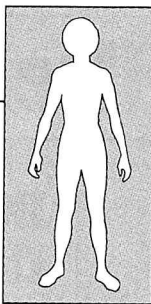
2. Have students feel the bones in their hand, arm, back, etc., and then brainstorm all the things they think the skeleton does. List their responses on the board. (Answers may include: forms the body's framework; protects the heart, brain, lungs, etc.; helps students stand, sit, and bend; helps them hear, etc.) You may wish to add that some bones produce blood cells and store minerals.

3. Mention to students that most people have 206 bones in their body. Some have fewer because they lack some small bones in their hands, feet, or tailbone. Others have more because of an extra pair of ribs. If students have put together the model of the ear, have them find the hammer, anvil, and stirrup, the smallest bones in the human body. Point out that while students can feel most of the bones in their body, they cannot feel them all.

## Making The Model

1. Reproduce a set of pages 54–60 for each student.
2. Have each student locate page 54,

## The Skeletal System



cut out the parts labeled SKULL and NECK BONES as one piece, and set aside the HANDS and FEET pieces for use later.

**3.** Have students locate page 55 and *along the heavy β cut line* cut out the bones *as one piece*. Ask students to tape the lowest neck bone on the SKULL AND NECKBONES piece on top of the BACKBONES as indicated.

**4.** On page 56, have students cut out the PELVIS and set aside the arm bones for use later. Paste the lowest bone on the backbones to the top of the pelvis as indicated.

**5.** You may wish to take a moment to point out that looking at the skull, etc., is like looking in a mirror; that is, left and right are reversed. Have students locate the parts labeled LEFT ARM BONES (upper and lower) on page 56 and cut them out. Glue the ELBOW TAB behind the end of the upper arm bone with the black dot labeled ELBOW. When dry, glue the top of the LEFT UPPER ARM BONE, or humerus, to the model from page 55 where it says TAPE LEFT UPPER ARM BONE.

**6.** Repeat Step 5 using the parts labeled RIGHT ARM BONES (upper and lower).

**7.** Have students locate the parts labeled LEFT LEG BONES (upper and lower) on page 57 and cut them out. Tape the tab below the kneecap on the long bone behind the end of the bone with the black dot. Tape the top of that bone to the PELVIS where it says PASTE LEFT FEMUR on the model.

**8.** Repeat Step 7 using the RIGHT LEG BONES.

**9.** On page 57 cut out the two KNEECAPS and tape where indicated.

**10.** Return to page 54 and cut out the LEFT HAND and LEFT FOOT.

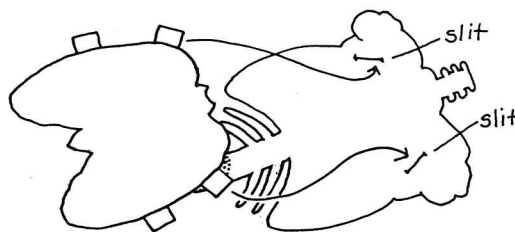
Glue the tab on each behind the bottom of the LEFT ARM and LEFT LEG respectively.

**11.** Repeat Step 10 using the RIGHT HAND and RIGHT FOOT.

**12.** Have students locate page 58 and explain that they are first to cut out the piece along the outer (heavy) cut line. When the piece is in place (see below), students will cut it open along the dark cut line inside the piece. Stress that this cut is for them to be able to open the RIB CAGE and that there is no such "cut" inside the human body.

**13.** Once students cut out the RIB CAGE, have them find SLIT A and SLIT B on their model. Cut along each slit line (younger students may need help with this).

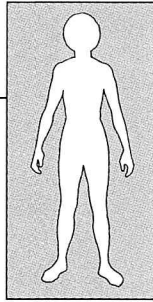
**a.** Insert the SLIT A TAB and the SLIT B TAB on the RIB CAGE piece into their respective slots and tape each to the back of the model.



**b.** Fold back the other two tabs on the rib cage labeled FOLD AND TAPE BEHIND BACKBONE and tape each to the back of the model.

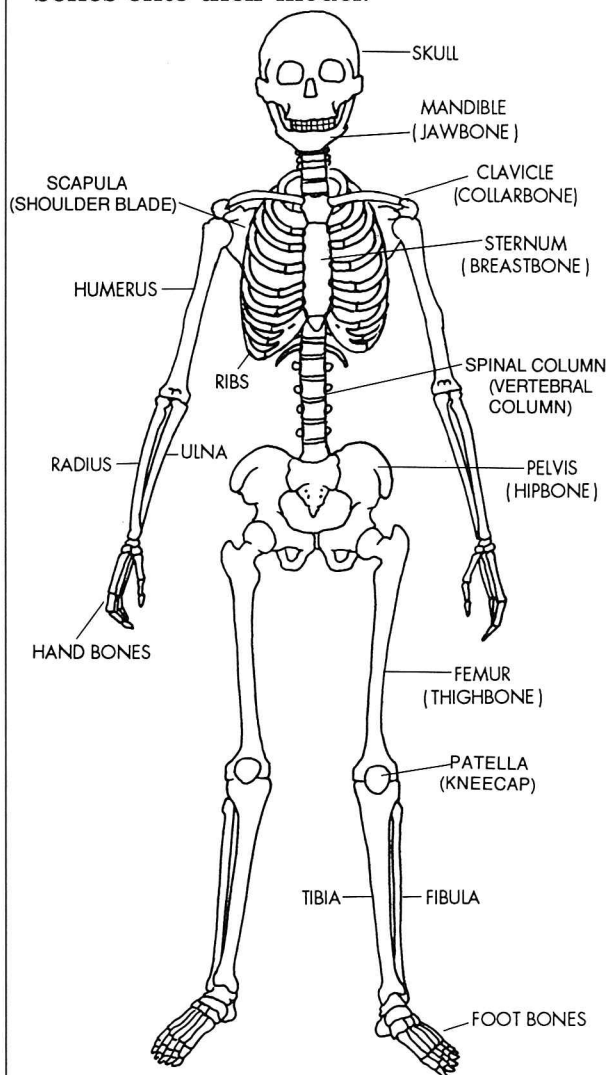
**c.** Cut open the RIB CAGE and look inside.

## The Skeleton



### Using The Model

**1.** Students can work individually or in groups. Ask them to locate bones that they know, such as the SKULL, BACKBONE, and RIBS, and label them. Then ask them to locate groups of bones such as arm and leg bones and count them. Depending upon your curriculum you may wish to have students label bones with their common name, such as the shoulder blade, and/or with their scientific name, such as scapula. Or you can hand out the following key and ask students to copy the names of the bones onto their model.



**2.** Ask students to point out long bones and short bones or make a list on the board. Mention that the thighbone, or FEMUR, is the body's longest, strongest, heaviest bone.

**3.** Students can play the "Thighbone's Connected to the Hipbone" game by starting with one student and going around the room with each student adding to the list. Or one student can call out the name of a bone and ask the rest of the class what it is "connected" to.

**4.** Ask students:

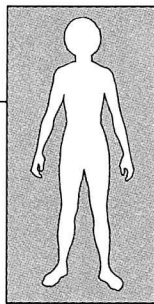
- Which bones do you think support the weight of your body when you stand? (leg bones)
- Which bones do you use when you swing a bat? (hand, arm, shoulder bones).
- On which bone do you sit? (hipbone)
- Continue with other questions.

**5.** Focus on the SKULL and explain that it is made up of 29 bones, most of which have grown tightly together. Ask students:

- Can you figure out which skull bone can be moved up, down, and sideways? (jawbone)
- How does this movement help you eat? (biting and chewing with their teeth)
- Which body parts does our strong skull protect? (brain, eyes, ears, nose, and mouth)

**6.** Focus on the RIBS and have students count how many there are. Ask students where most of the ribs connect (to the breastbone in front and the backbone in back). Point out that the two pairs of ribs that connect only to the BACKBONE are called floating

## The Skeleton



ribs. Ask students to breathe in and out as they feel their ribs move, helping them breathe. Ask which body parts the ribs protect (heart and lungs).

**7.** Focus on the BACKBONE and explain that it is made up of small bones called *vertebrae*. Ask students why they think that animals with backbones are called *vertebrates*? Then ask students to name other animals with backbones. List the five groups of vertebrates on the board: fishes, amphibians, reptiles, birds, and mammals. In which group do students think that human beings belong? (mammals)

**a.** Be sure that students understand that the BACKBONE on their model was put together in three pieces. The first piece was at the base of the skull, the middle piece continued to the hipbone, and the third piece was part of the PELVIS where the sacrum and coccyx—each made of 4 or 5 vertebrae fused together—fit in.

**b.** Have students count the number of vertebrae in the BACKBONE. They can also bend, twist, and turn the backbone on their model to mimic how their backbone helps them move.

**c.** Mention to students that the body's main nerve cord, the spinal cord, runs through the backbone.

**8.** Teach students that bones cannot move by themselves: they are moved by muscles attached to them. Bones can only be moved by muscles at joints, the places where bones meet. Refer to the section on joints and the models of how they work on pages 61–64. Also see page 124 for how muscles move bones.

**9.** You may wish to mention the following to older students: The skeleton is made up of both bone and

cartilage. Cartilage, which they can feel in the top of their nose and in their outer ears, is softer and more flexible than bone.

There is cartilage where the ribs attach to the breastbone and in the windpipe and voicebox. Between most vertebrae there are cartilage disks that help absorb shock and keep one vertebra from hitting another. If a disk squeezes or slips out of place and presses on nerves, it can cause severe pain. Refer to the model of a bone on page 69 to discuss what bones are made of.

## More To Do And Learn

When students have completed these activities, have them set aside their skeletons so they can fit other systems into it as they build the human body.

### 1. Color the Model

Invite students to color the skeleton or different groups of bones such as arm, leg, skull, ribs, etc.

### 2. Name That Bone

Divide students into groups. Ask each group to select a bone and then come up with clues that will help the rest of the class figure out which bone they chose. For example, they can say, "It is a long bone, it is a strong bone; it is connected to the hipbone: it helps bear our weight when we stand," etc.

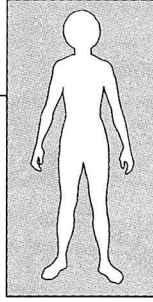
### 3. Using Bones

Divide students into groups and have each group think of an activity such as throwing a football. For each activity have a group ask the rest of the class which bones they would use.

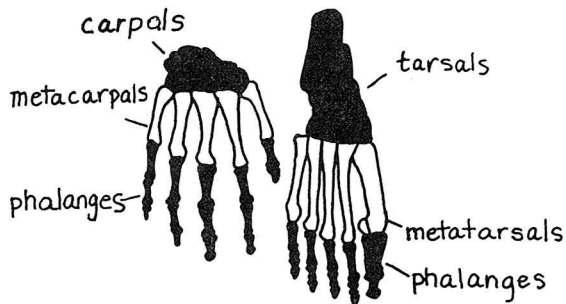
### 4. Bone Mobile

Reproduce pages 59 and 60 for each student. Point out how similar the hand and foot bones are. Explain that

## The Skeleton



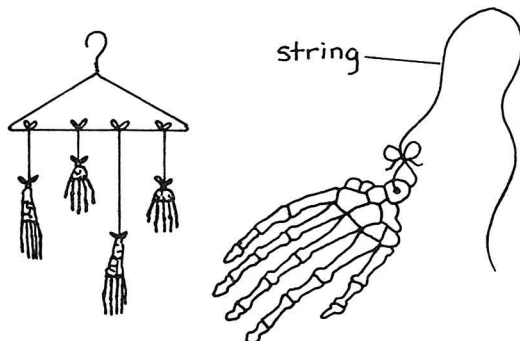
the hand is divided into wrist bones called **CARPALS**, hand bones called **METACARPALS**, and finger bones called **PHALANGES**. Mention that *carpal* comes from the Greek word for wrist, the prefix *meta-* means "situated behind," and the word *phalanges* means "a finger or toe bone." Invite students to color the wrist bones yellow, the hand bones blue, and the finger bones red.



Have students cut out each hand, punch a hole in the black dot, and tie a string in the hole.

Focus on the foot and explain that it is divided into the ankle bones, or **TARSALS** (from the Greek word for ankle), the foot bones, or **METATARSALS**, and the toe bones, or **PHALANGES**. Color the ankle bones yellow, the foot bones blue, and the phalanges, red. Cut out and tie as above.

Students can tie the cut-out hands and feet to a hanger to form a mobile.



You may wish to have students note that the thumb and big toe are made up of two bones while the other fingers and toes are each made up of three bones. Also, in most people, the bones in the foot

form an arch that supports body weight and helps absorb shocks when walking, running, and jumping. (NOTE: The skeleton model will be used again in the unit on the Respiratory System.)

## Making Connections

Divide students into groups and ask them to prepare the following to present to the class:

**a.** A report on what other kinds of skeletons are found in the animal kingdom and whether there are any animals that lack a skeleton.

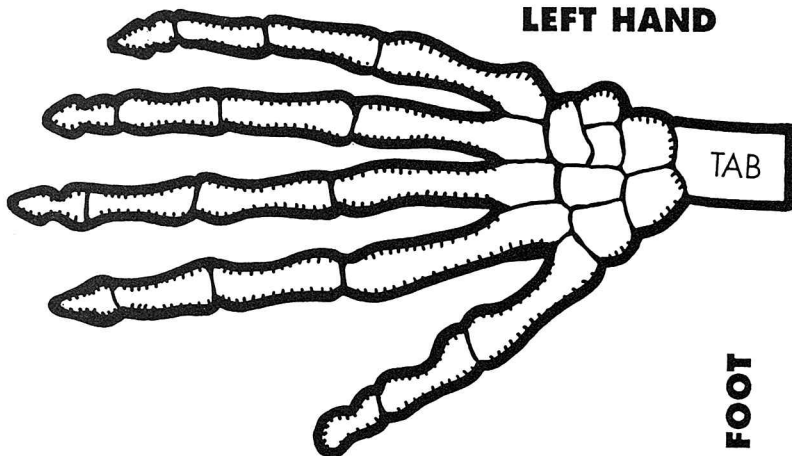
**b.** A report on how a dinosaur skeleton was like or different from a human skeleton.

**c.** A report on how a snake's skeleton and a human skeleton are alike or different.

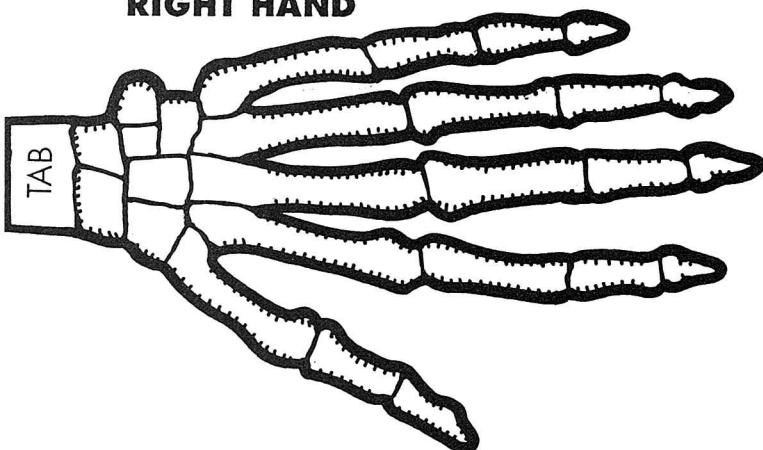
**d.** A report on what happens when a bone breaks.

**e.** A report on which part of a horse's foot a horse stands on.

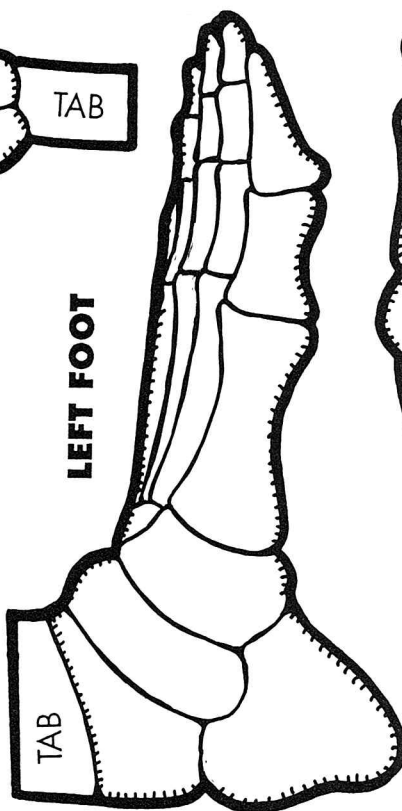
**LEFT HAND**



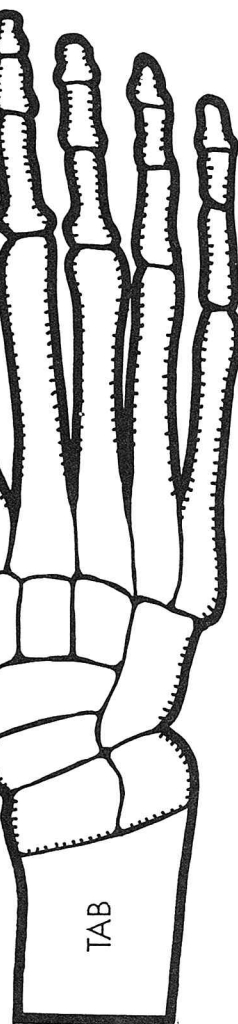
**RIGHT HAND**



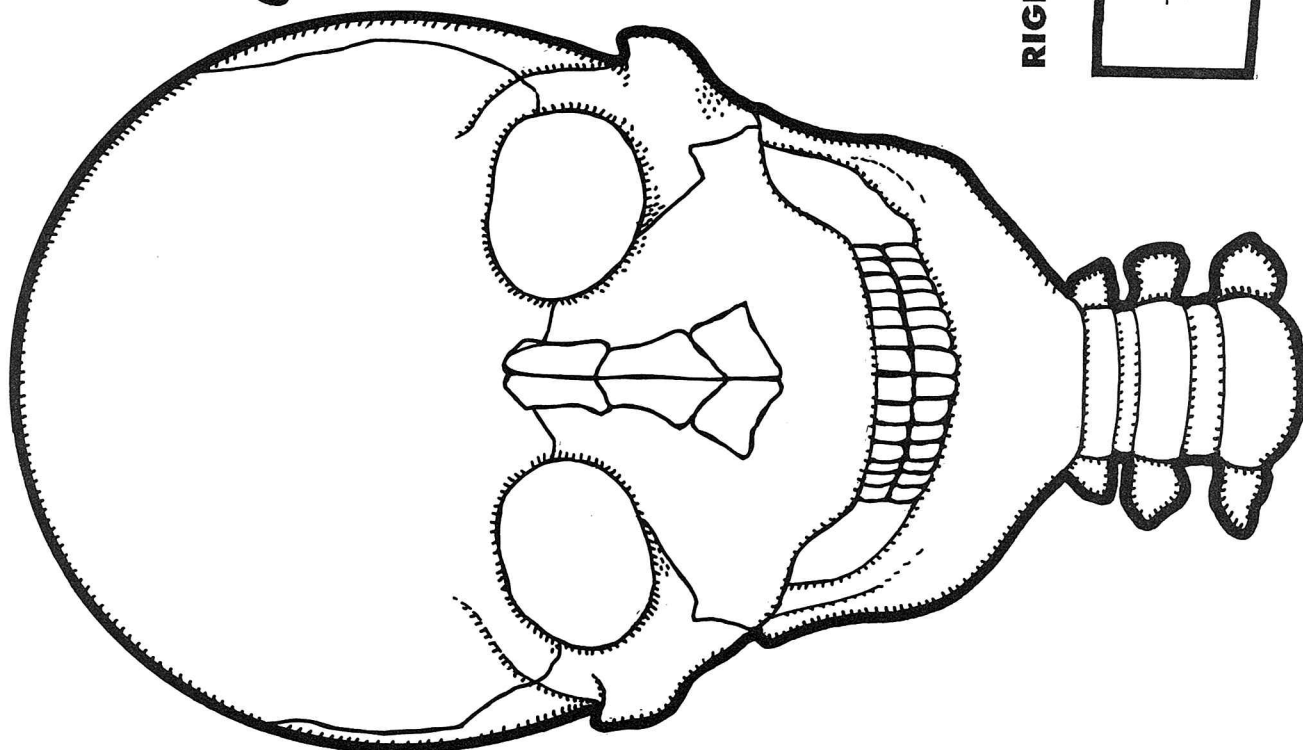
**LEFT FOOT**



**RIGHT FOOT**



**SKULL AND NECK BONES**



TAPE NECK BONE

HERE

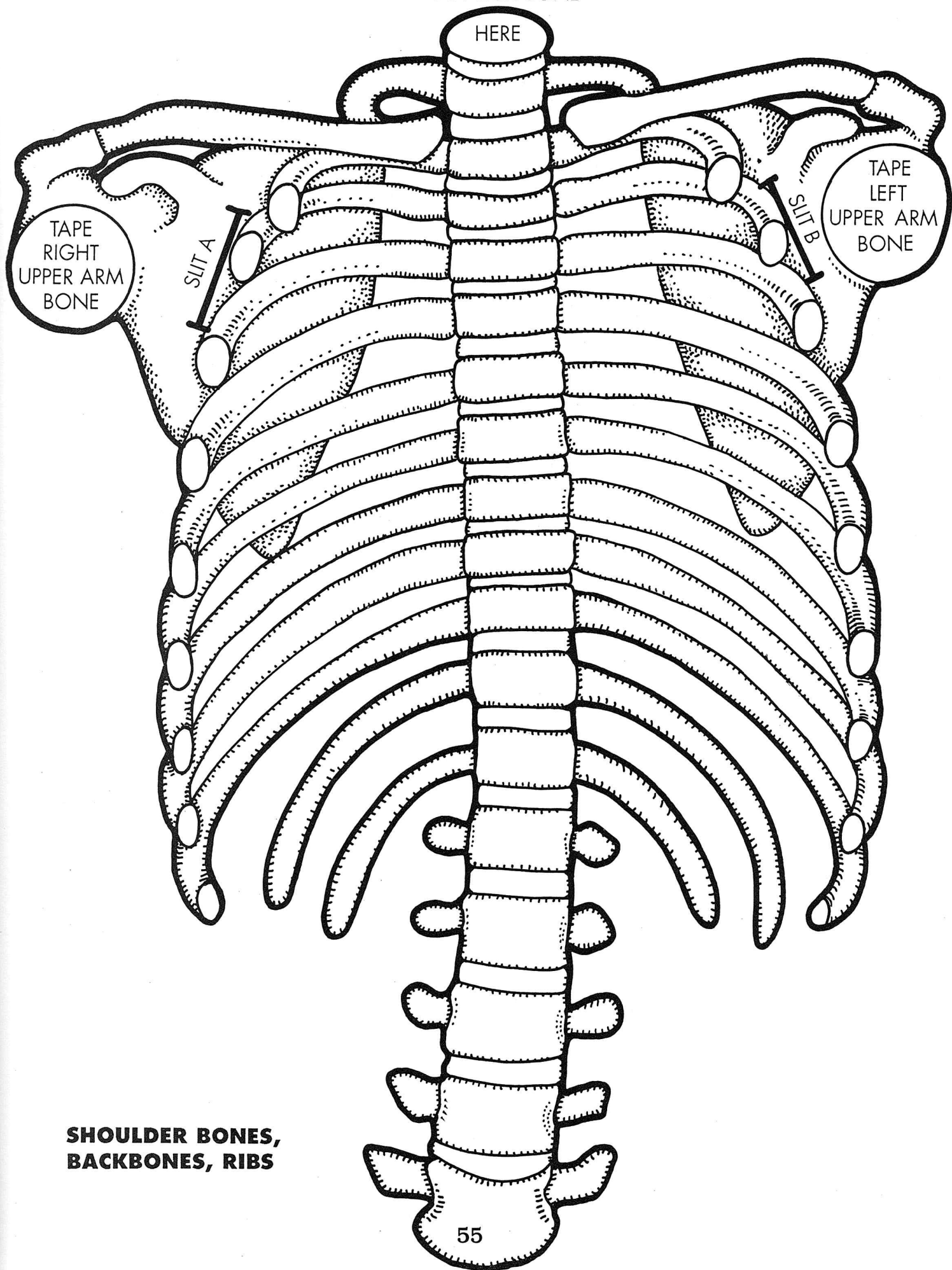
TAPE  
RIGHT  
UPPER ARM  
BONE

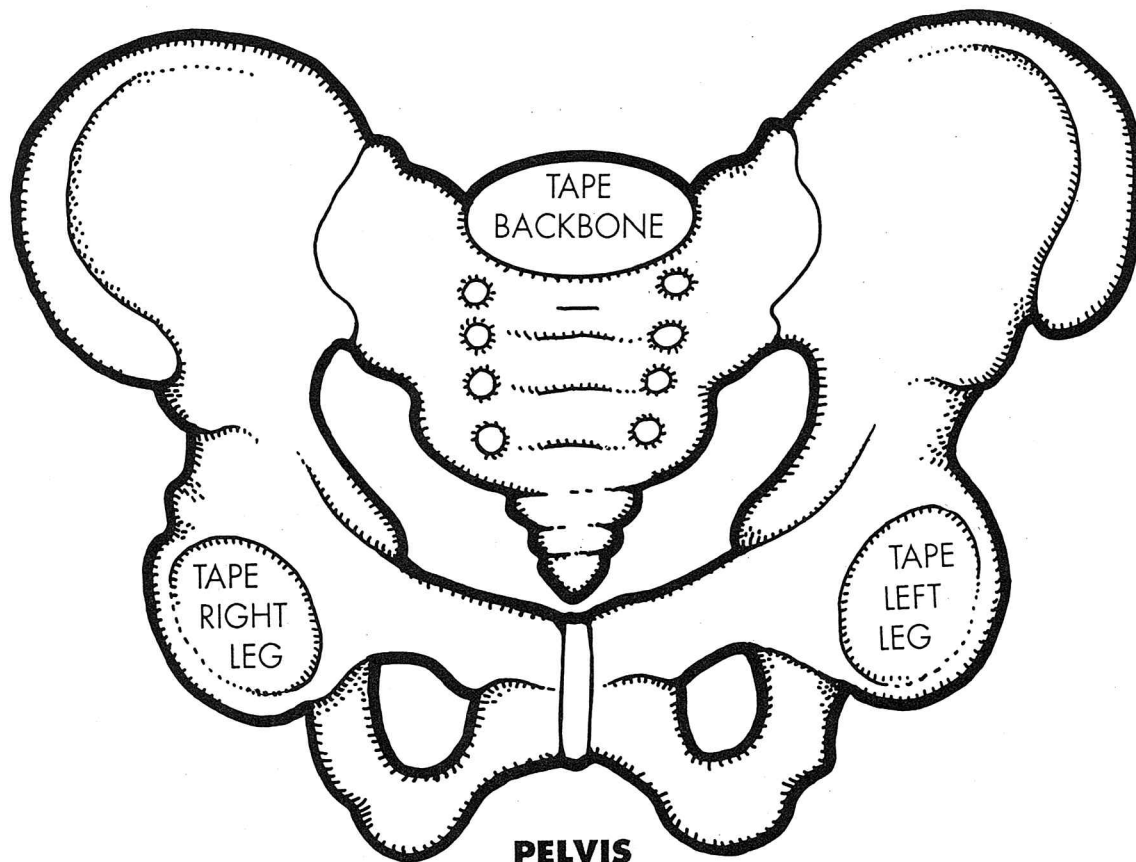
SLIT A

TAPE  
LEFT  
UPPER ARM  
BONE

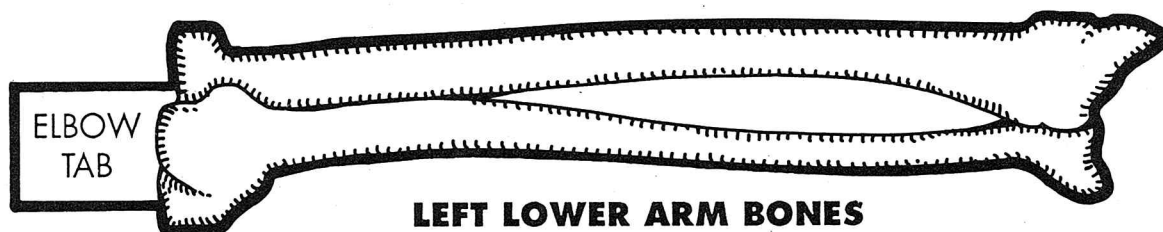
SLIT B

**SHOULDER BONES,  
BACKBONES, RIBS**

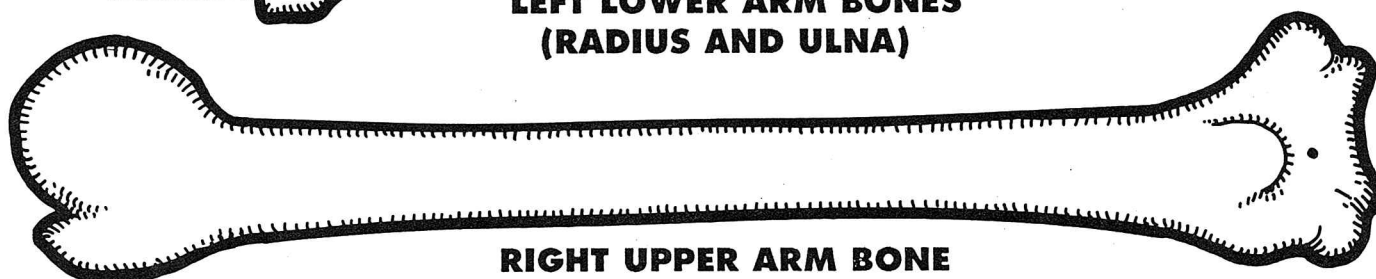




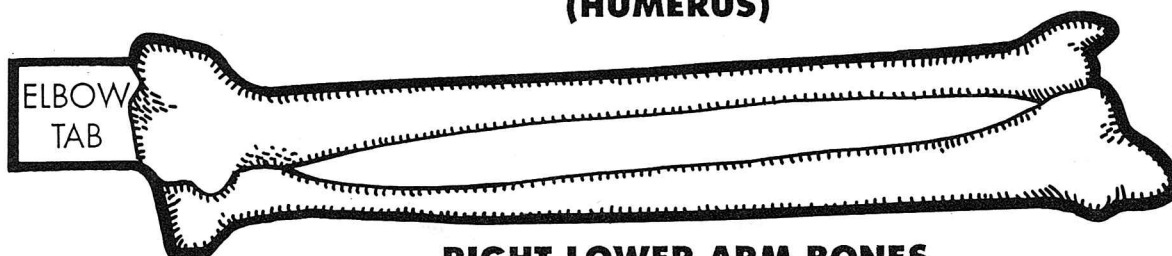
**LEFT UPPER ARM BONE  
(HUMERUS)**



**LEFT LOWER ARM BONES  
(RADIUS AND ULNA)**

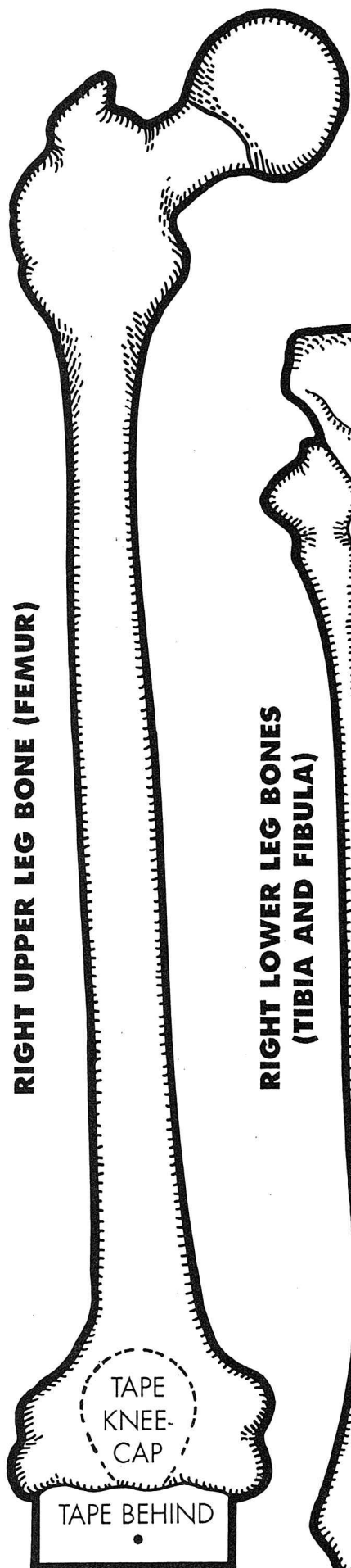


**RIGHT UPPER ARM BONE  
(HUMERUS)**

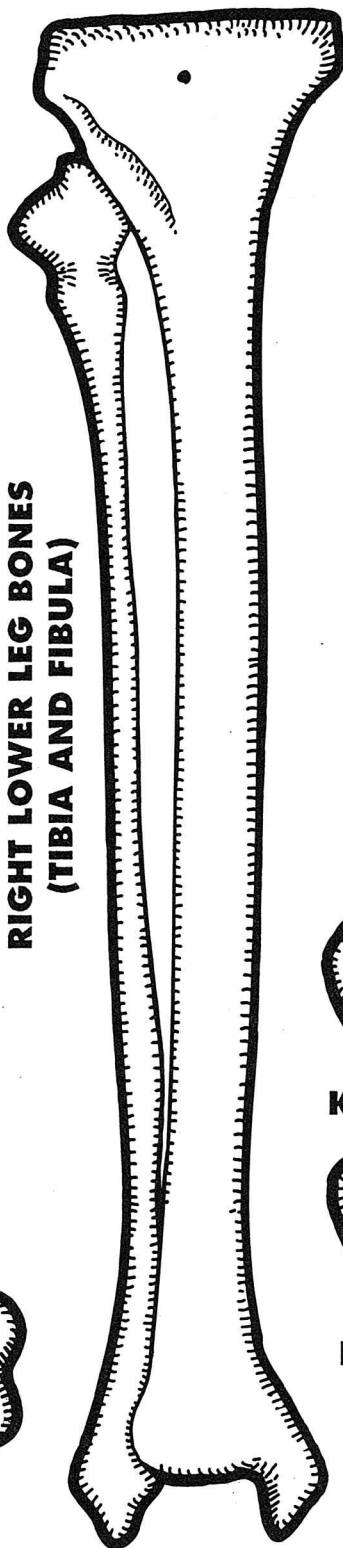


**RIGHT LOWER ARM BONES  
(RADIUS AND ULNA)**

**RIGHT UPPER LEG BONE (FEMUR)**



**RIGHT LOWER LEG BONES  
(TIBIA AND FIBULA)**

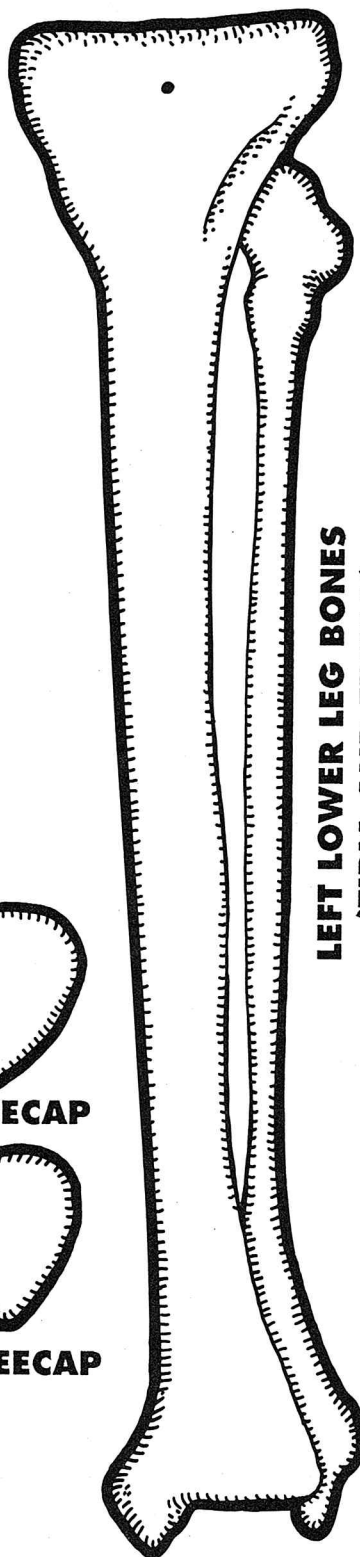


**KNEECAP**

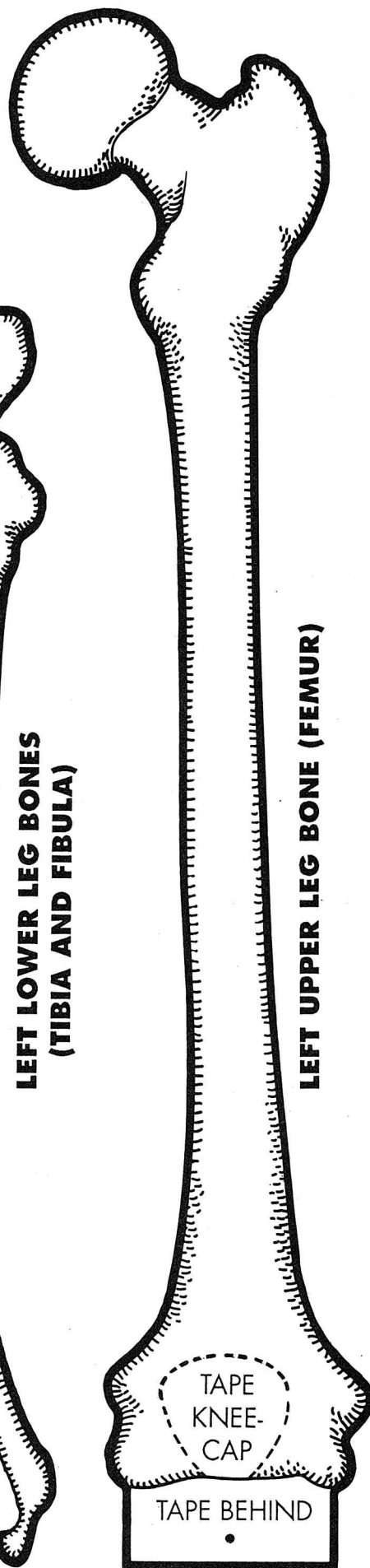


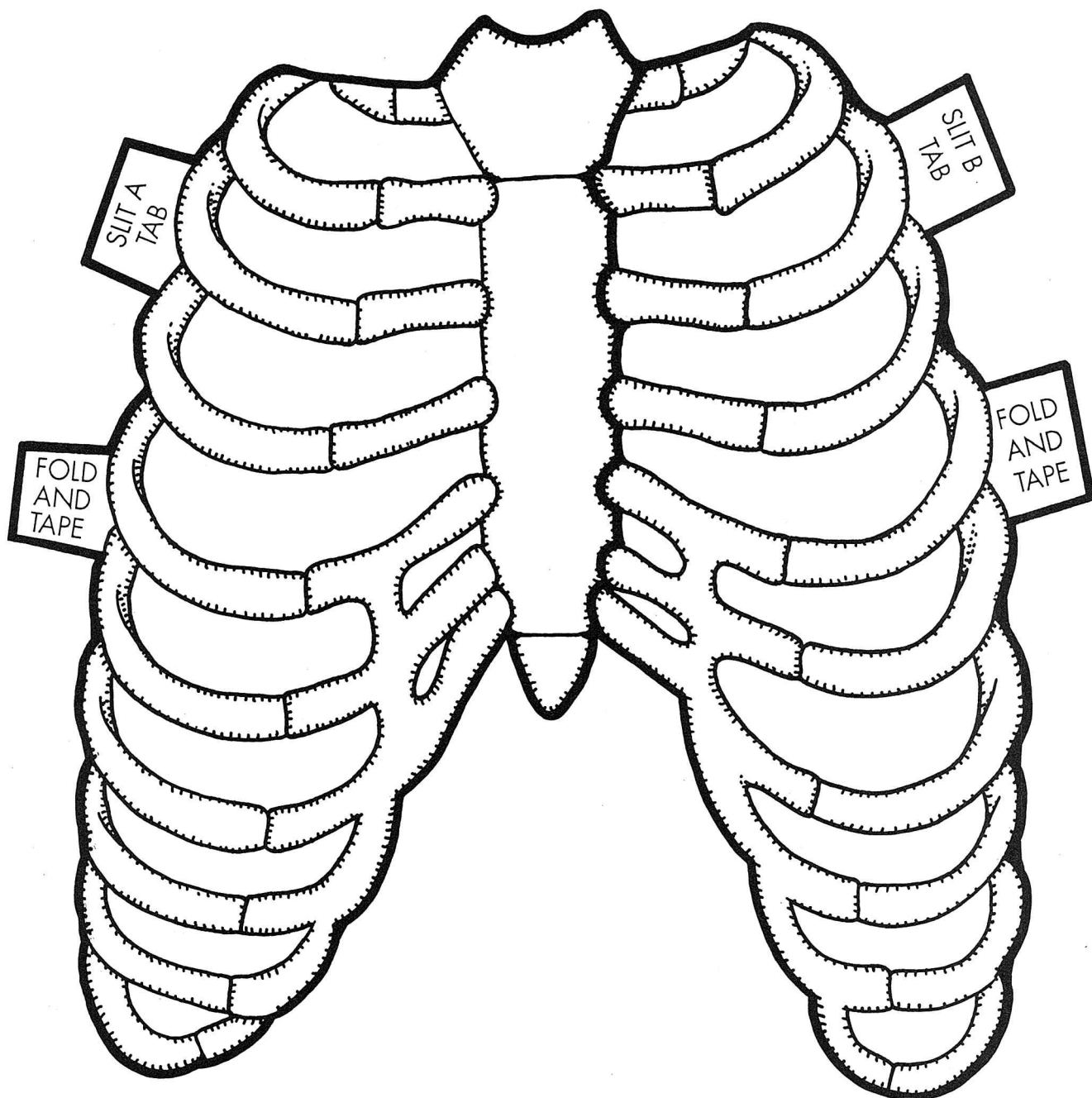
**KNEECAP**

**LEFT LOWER LEG BONES  
(TIBIA AND FIBULA)**

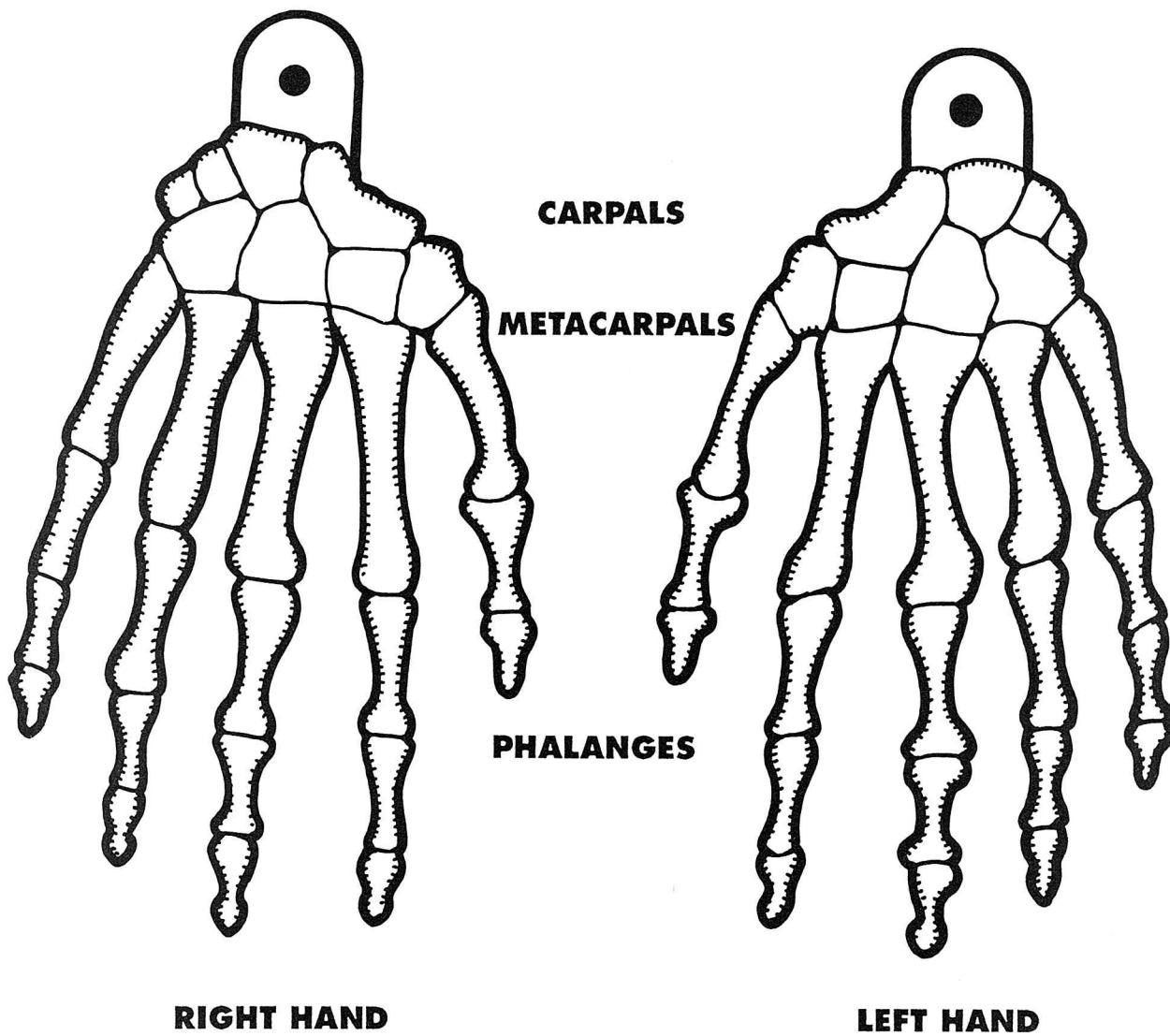


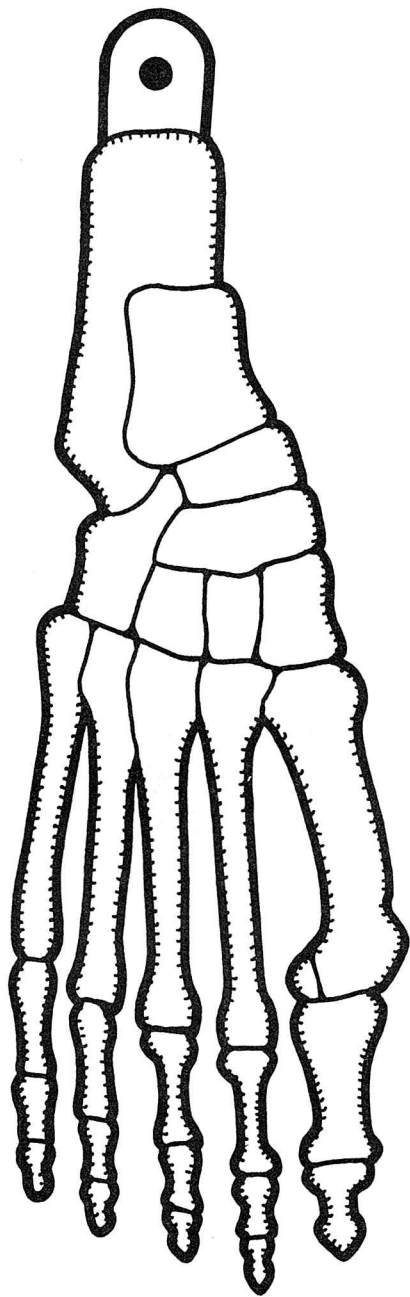
**LEFT UPPER LEG BONE (FEMUR)**





**RIB CAGE**



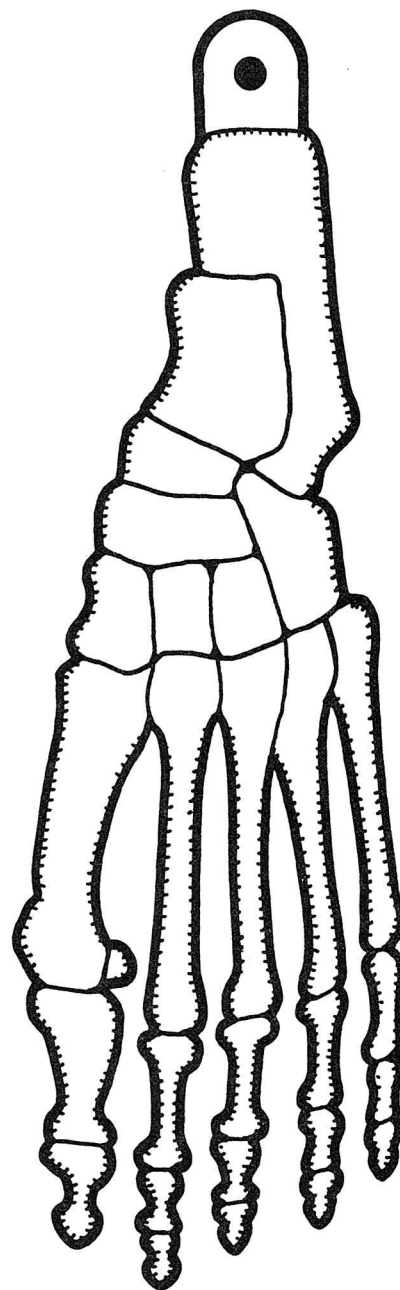


**RIGHT FOOT**

**TARSALS**

**METATARSALS**

**PHALANGES**



**LEFT FOOT**